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absence for research in Europe. Professor Fullerton never intended to retain the Vice-Provostship of the University, and only accepted the position while the University was being reorganized after the election of Provost Harrison.

PRESIDENT ANDREW S. DRAPER, of the University of Illinois, having declined the Superintendency of the schools of New York City, Dr. W. H. Maxwell, Superintendent of the Brooklyn schools, was elected Superintendent on March 15th.

Of the three travelling fellowships annually awarded at Bryn Mawr College, two have been awarded in the sciences—the President's fellowship to Miss L. R. Laird, a student of physics, and the Mary E. Garrett European fellowship to Miss F. Peebles, a student of biology.

MR. D. E. O. LOVITT has been elected assistant professor of mathematics in the John C. Green School of Science, of Princeton University.

PROFESSOR P. HENSEL, Strassburg, has been called to an assistant professorship of philosophy newly established at Heidelberg.

DR. GEORGE TREILLE has been appointed to the newly established chair of colonial hygiene in the University of Brussels.

THE University of Göttingen will again this year offer, during the Easter holidays, courses in science for teachers. No charge is made for attendance on these courses.

#### DISCUSSION AND CORRESPONDENCE.

##### THE LONGEVITY OF SCIENTIFIC MEN.

PROFESSOR EDWARD S. HOLDEN contributes to the last number of the *Cosmopolitan* an article 'On the Choice of a Profession: Science 'intended to be' of distinct use to young men and women of the *Cosmopolitan* University.' In the course of the article occurs the following:

Among the advantages of following science as a profession we must certainly reckon its undoubted tendency to prolong the lives of its votaries. It is not a little remarkable that men of science, astronomers among them, are particularly long lived. The average longevity of men is about thirty-three years. Some one has had the patience to determine the aver-

age age of some seventeen hundred astronomers and mathematicians, and it turns out to be sixty-four years! That is, astronomers live nearly twice as long as men in general. \* \* \* I think no one can fail to be surprised at the foregoing statistics.

Professor Holden is certainly right as to the surprise likely to be awakened by these statistics. An exclamation mark or a question mark would perhaps be sufficient comment for scientific men; but for the benefit of the young persons of the *Cosmopolitan* 'University' it may be explained that none of the 1,700 eminent astronomers and mathematicians died when they were infants. We do not know the average age at which work was done that would entitle a man to be included in this list of astronomers and mathematicians, but if it were forty years, we know that the expectation of life for men of that age is (according to tables of the Institute of Actuaries) 27.4 years. The average age at death of ordinary men would then be 67.4 years and of the astronomers and mathematicians, 64 years.

J. McK. C.

##### THE REVIVAL OF ALCHEMY—A REJOINDER.

IN SCIENCE of December 10th Dr. H. Carington Bolton makes personal mention of me and inferentially describes me as being an 'educated charlatan' and as having 'cracked brains.' He also says, inferentially, that I belong to a class of persons who 'wear their feather in their heads,' an expression that is not very clear to me, but I suppose implies something more and worse than the feat ascribed in popular song to Yankee Doodle. But, however, this may be, I presume that, as a matter of even-handed justice, space will be accorded me in SCIENCE for the following reply:

1. Dr. Bolton's characterization of me is either a simple expression of his opinion or a conclusion from premisses.

2. Opinions need to be weighed before acceptance. Dr. Bolton says that "Sir Isaac Newton dabbled with furnaces and chemicals in true hermetic style; and Leibnitz showed the courage of his convictions by acting as Secretary of an Alchemical Society in Germany," and, further, that "so eminent a chemist as Sir Humphry Davy did not hesitate to affirm

that some of the doctrines of alchemy are not unphilosophical." This is an admission that the opinions of Newton, Leibnitz and Davy concerning alchemy were contrary to those now entertained by Dr. Bolton. On which side is the *weight*? Has Dr. Bolton ever distinguished himself by any scientific research? Has he made any notable discovery or invention? Has he propounded any law or doctrine of utility in the elucidation of natural truth? Or has he merely played the part of a scientific chronicler? If the answer to the last of these questions be in the affirmative, I think the scientific world will be slow to admit Dr. Bolton's authority to predicate 'cracked brains' in the cases of Newton, Leibnitz and Davy, or even in that of myself.

3. The bounden duty of a scientific chronicler is to be truthful and exact. Otherwise, his chronicles are misleading and injurious to the cause of science, and may seriously compromise the reputation of the journals that publish them. I regret very much to say that the article to which I am replying contains grave inaccuracies.

For example, after giving an account of Strindberg's famous gold-making experiment, Dr. Bolton says: "After showing by appropriate tests that iron is still present, the hermetic chemist proceeds to explain the reaction by assuming the formation of the hypothetical  $\text{Fe}_3\text{S} = 196 = \text{Au} * * *$  and he adds, 'The chlorid of gold is reduced by the nicotine of the cigar.' Since, however, no reagent containing chlorin in any form was used in the experiment, this element must have been created at the same time with the gold, which, however, is 'incomplete' gold soluble in unmixed acids."

Now, I happen to possess a copy of Strindberg's 'Gold-Synthese,' and I am, therefore, able to quote his exact words, which are as follows:

"Man taucht ein Papierstreifen in eine Lösung von Eisensulfat. Raucht über der Ammoniakflasche, und es wird grün gefärbt (wie Goldoxidul); wärmt es über eine angezündeten Cigarre,\* und es wird braun (wie Gold-oxid). Später erscheinen gelbe metallische Flittern, welche aus Gold in äusserst verdumtem Zustande bestehen."

\* Nikotin reducirt Gold.

Here it will be seen that not a word is said about chloride of gold or chlorine.

Perhaps Dr. Bolton has never seen Strindberg's 'Gold-Synthese,' and by reporting and quoting at second-hand has inadvertently borne false witness against his neighbor. An explanation is certainly in order.

Another instance of inaccuracy is the reference to Tiffereau. Dr. Bolton gives an account of a memoir submitted to the Académie des Sciences in which carbon-compounds were said to have been formed by the action of nitric acid on metallic aluminum; and he says, by way of comment: "Analytical chemists would criticise this experiment in several points; they would say Tiffereau did not demonstrate the absence of carbon in the metal used, and that he depended upon smell and taste for proofs of the carbon compounds."

The memoir here alluded to was merely a preliminary announcement. It was followed by another describing a much more complete test, in which the flask containing the nitric acid and aluminum was connected with one containing baryta-water, this latter showing a deposit of barium carbonate at the conclusion of the experiment. Tiffereau's exact words are as follows:

"Un chimiste expert, chargé de l'analyse, a trouvé dans le flacon *a*, du nitrate d'aluminum et une partie silicieuse dont le poids, après incinération, a été de 0.018.

"L'analyse du dépôt du flacon *c* a décélé la présence du carbonate de baryum mélangé avec de l'alumine dans les proportions suivantes—

Carbonate de baryum . . .	0.129
Alumine . . . . .	0.005
Poids du dépôt . . . .	0.134

"L'expérience a donc donné 0.00785 de carbone, alors que l'aluminum employé n'en contenait que 0.00075, c'est à dire, 10 fois moins."

I ask all fair-minded men of science whether justice was done to Mons. Tiffereau in Dr. Bolton's paper, and whether the latter can be accepted as a scientifically-veracious account of a scientifically important research?

4. I now proceed to consider whether Dr. Bolton's attribution of 'cracked brains' to Newton, Leibnitz, Davy and myself, and his

wholesale denunciation of 'a company of educated charlatans' by whom he says 'the revival of alchemy is now being engineered' are indeed logical conclusions from admissible premisses.

His argument seems to be as follows :

- A. Certain substances, each of which possesses certain specific physical properties, are by chemists denominated 'elements.'

No human being can, by any method, effect any change in any specific physical property of any 'element.'

Any human being who ventures to think that any method has been, or may yet be, discovered of changing any specific property of any element is, to that extent, insane.

Newton, Leibnitz, Davy and Emmens have been thus bold.

*Ergo*, they have 'cracked brains.'

- B. Souls do not exist. There is no God. The universe consists solely of what physicists call Matter, Ether and Energy.

Any system of thought and research which enquires into Soul, as well as into Matter, Ether and Energy, is quackery.

Certain writings of certain members of a certain Society are based upon the recognition of Soul as an operative existence in connection with Matter, Ether and Energy.

*Ergo*, this Society is 'a company of educated charlatans.'

- C. The honorary members of every Society must be adjudged to participate in the views expressed by all the writings of all the members of such Society.

Flammarion, Strindberg and Emmens have been elected as honorary members of the Alchemical Association of France.

*Ergo*, they are 'educated charlatans.'

If the foregoing tissue of self-evident nonsense be not a fair presentation of Dr. Bolton's argument, let him correct it. Should he attempt to do so, *while preserving a syllogistic form*, the result will be instructive to himself.

5. Finally, it is proper for me to state where I actually stand as regards the whole matter.

I do not claim, and have never claimed, to *make* gold in the alchemical sense of the phrase.

I do not ask, and have never asked, the scientific world for any recognition of my work in connection with the interchangeability of gold and silver. This Dr. Bolton has long known. At his request I sent him a copy of *Arcana Naturæ* in which is set forth a letter written by me on May 21, 1897, to Sir William Crookes, F.R.S. That letter contained the following words :

"The gold-producing work in our Argentaurum laboratory is a case of sheer Mammon-seeking. It is not being carried on for the sake of science or in a proselytizing spirit. *No disciples are desired and no believers are asked for.*"

I have, however, given every chemist and physicist the opportunity, if desired, of investigating the fundamental portion of my work. The necessary instructions for the requisite experiment have been widely published. I have thus shifted the *onus probandi*. Let the critics do a little solid scientific work as a foundation for their clamor before they snap at the heels of men who make discoveries while they ply idle pens.

I do not profess to have shown how gold or its simulacrum may be produced at a commercial profit. I should, indeed, have 'cracked brains' were I to part with the control of the greatest power the world has ever witnessed.

I do, however, profess to be utilizing this power for the good of science at large. In addition to various physical researches of great interest and importance now being prosecuted in the Argentaurum laboratory, I am aiding students of nature in all parts of the world to observe and collate *facts* in rectification of much hypothesis that now does duty for truth. By so doing I, of course, incur the enmity of those who bow the knee to Mumbo-Jumbo ; but many a broad-minded and eminent leader of science is corresponding with me in terms of amity and sympathetic encouragement.

STEPHEN H. EMMENS.

Addendum. I take this opportunity of making an explanation with reference to another matter.

It will be remembered that in SCIENCE of February 19, 1897, Professor R. S. Woodward noticed a book of mine entitled 'The Argentaurum Papers No. 1.' The notice was not a review and made no attempt to deal with any of the arguments in the book. It was merely a personal attack upon myself in terms calculated to seriously injure me in the exercise of my profession as a scientific expert. Self-defense was, therefore, necessary; and as I had what I judged to be good reason for supposing that the columns of SCIENCE were closed against any reply on my part, I laid the matter before my legal advisers, and, in accordance with their counsel, I commenced an action for libel against the 'responsible editor' of SCIENCE and Professor Woodward. I fully recognized the inexpediency of such actions as a general rule, and the desirability, in the true interests of philosophy, of permitting absolute freedom of criticism; but I supposed, in this particular case, that an appeal to the law was the only remedy within my reach. I have recently been led to understand that this supposition is erroneous, and that the right to be heard in self-defense was not disputed by the editor of SCIENCE. Under these circumstances I have no intention of proceeding further with the action for libel.

Since writing the foregoing I have received a letter from a very eminent Fellow of the Royal Society informing me that he has performed the crucial experiment suggested in my letter of May 21, 1897, to Sir William Crookes. The gold contained in a Mexican dollar after forty hours of intense cold and continued hammering was found to be 20.9 per cent. more than the quantity of gold contained in the same dollar before the test.

S. H. E.

#### SCIENTIFIC LITERATURE.

*Encyclopédie scientifique des aide-mémoire, Les huiles minérales, Petrole, Schiste, Lignite, par FRANCOIS MIRON. Licencié ès Sciences Physiques Ingénieur Civil. Publiée sous la direction de M. Léauté, Membre de L'Institut. Paris, Gautier-Villars et Fils.*

There are no deposits of petroleum in France of commercial value. This fact may furnish a

reason why no work upon petroleum of any value has been published in France.

When, a few years since, after a visit to Trinidad, I published a paper on the celebrated Lake, in the *American Journal of Science*, I sent a copy of the paper to M. Alphonse Daubrée and asked him to secure its translation and insertion in some reputable French scientific journal. It was reprinted entire in the *English Geological Magazine* and it was also translated and inserted in one of the scientific journals of Germany. M. Daubrée replied that, while he would like to comply with my request, the French journals printed only original articles. This statement may further explain why the papers of Dr. Hunt, published thirty years ago in French journals, are still quoted by French authors as if they were the only papers extant upon American petroleum. This fact may still further explain why the work before us, which forms a part of an 'Encyclopédie des Aide-Mémoire,' is neither up to date nor correct to any date. Although the title page is without date, it appears to be just issued; yet the latest date mentioned in association with American petroleum is 1888 and with European petroleum is 1892.

Speaking of the distribution of petroleum, our author says, "In Ohio the deposits of Trumbull, Loraine and Washington were known from time immemorial." These counties are arranged inversely as to their importance, and the Trenton limestone deposits of northwest Ohio—by far the most important of all—are not mentioned at all. He says further, "In Colorado at Cañon City, in Michigan on the shores of Lake Huron, the county of Cumberland in Kentucky and the environs of Santa Clara county in California have yielded and still yield an important production." There is no production at all in Michigan, none of any importance in Cumberland county, Ky., and in California, while petroleum is found in Santa Clara county, the large and important production in that State, is yielded in Los Angeles and Ventura counties, several hundred miles south, between Santa Barbara and Los Angeles.

In his table which shows the geological distribution of petroleum the very important Trenton limestone deposits are not mentioned;